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ABSTRACT

It is known that first year Information Systems students have different levels of computer literacy when they enter the university. This is specifically the case in South Africa, where large numbers of students come from disadvantaged educational backgrounds. Universities sometimes try to overcome the disparity in computer literacy by introducing bridging courses or extra classes for the computer illiterate students. The use of cooperative learning and information technology may enable the lecturers and students to cope with the demands of a first year course in Information Systems. The planning of telecenters using cooperative learning techniques is, however, crucial for the success of such an endeavor. This paper focuses on an evaluation framework for the planning of ITCL (information technology supported cooperative learning) in telecenters for students. The components involved in the implementation of ITCL at telecenters are identified. A questionnaire that can be used for evaluation of the planning of ITCL centers is discussed in detail; in this questionnaire, specific questions about the different components involved in the planning of ITCL centers are provided to guide the lecturers in the establishment of such a center to ensure that the correct ITCL environment is created. (Contains 31 references.) (Author/AEF)

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EVALUATING THE PLANNING OF INFORMATION TECHNOLOGY SUPPORTED CO-OPERATIVE LEARNING (ITCL) CENTRES FOR THE TEACHING OF INFORMATION SYSTEMS

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC).

In the teaching of first year Information Systems students, it is a known fact that the students have different levels of computer literacy when they enter the university. This is specifically the case in South Africa, where large numbers of students come from disadvantaged educational backgrounds. Universities sometimes try to overcome the disparity in computer literacy by introducing bridging courses or extra classes for the computer illiterate students. The use of co-operative learning and information technology may enable the lecturers and students to cope with the demands of a first year course in Information Systems. The planning of telecentres using co-operative learning techniques is however crucial for the success of such an endeavour. This paper will therefore focus on an evaluation framework for the planning of ITCL in telecentres for students. The components involved in the implementation of ITCL at telecentres will thus be identified in the paper. A questionnaire that can be used for the evaluation of the planning of ITCL centres will be discussed in detail. In this questionnaire specific questions about the different components involved in the planning of ITCL centres will be provided to guide the lecturer in the establishment of such a centre and to help him or her to ensure that the correct ITCL environment is created.

INTRODUCTION

In the teaching of first year Information Systems students, it is a known fact that the students have different levels of computer literacy when they enter the university. This is specifically the case in South Africa, where large numbers of students come from disadvantaged educational backgrounds. Universities sometimes try to overcome the disparity in computer literacy by introducing bridging courses or extra classes for the computer illiterate students. The use of co-operative learning and information technology may enable the lecturers and students to cope with the demands of a first year course in Information Systems. The planning of telecentres using co-operative learning techniques is however crucial for the success of such an endeavour. This paper will therefore focus on an evaluation framework for the planning of ITCL in telecentres for students. Co-operative learning is an ideal learning approach to help students bridge the gap in their educational background. Information technology can enrich and improve co-operative learning if applied correctly. The establishment of a telecentre using a networking environment at a university may provide lecturers with a facility that will help them to cope better with the demands of computer illiterate students, as well as students with

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learning problems. Establishing such telecentres in rural communities, so that high school pupils could, besides their normal school hours, spend extra time on specific topics/subjects, using ITCL, might even have better results in bridging the educational gap that some first year students experience. Networking between telecentres at different universities can also enable lecturers and students to share information technology resources and expertise, particularly in the Information Systems field.

The components involved in the implementation of ITCL at telecentres will thus be identified in the paper. These components will include the lecturers, students, curricula, financing, information resources, technological infrastructure, as well as the non-technological infrastructure, and management. The diffusion of ITCL will also be considered in order to indicate how it can, by means of a "snowball"-effect, contribute to extended and continuous development of students. A questionnaire that can be used for the evaluation of the planning of ITCL centres will be discussed in detail. In this questionnaire specific questions about the different components involved in the planning of ITCL centres will be provided to guide the lecturer in the establishment of such a centre and to help him or her to ensure that the correct ITCL environment is created.

WHAT IS DEVELOPMENT?

Traditionally development is seen as economic progression from the primary sector (agriculture, mining and other prime productions), to the secondary sector (industries for construction and production) and finally to the tertiary sector (proving services).

According to Hobart (1993) sociologists and anthropologists have for a long time been critical of attempts to express development in true economical or technological terms and also of the assumptions on which these attempts have been based. Todaro (1989) has it that development is not only an economical phenomenon, but a multi-facet process that includes the reorganizing and reorientation of total economical and social systems: "The process of improving the quality of all human lives." This view of development is particularly of great importance to developing countries, where economic growth alone is not sufficient. Todaro points out three important aspects of development:

- ⇨ Life sustenance: the upliftment of people's life standard through relevant economical growth processes.
- ⇨ Self-esteem: to establish conditions that are favourable to the growth of people's self-esteem by creating social, political and economical systems and institutions that will better human respect and dignity.
- ⇨ Freedom of choice: increasing people's freedom of choice by extending the range of choice variables from which they can choose.

How can one determine whether development has taken place or not? According to Max Neef et al. (1989) development is about people and not about objects. The measurement of the quantitative growth of objects can be determined using indicators such as the gross national product (GNP) or the exchange rate. Measuring these indicators can be very easy and simple, but how does one measure the qualitative growth op people? Max Neef et al. (op. cit.) claims that the best development process is one that leads to the greatest improvement of human life quality. The indicators of development should therefore reflect on the wellbeing of the individual. The life quality of people can be improved if the human needs, which are not satisfied completely, could be identified and addressed.

According to Hobart (1993) solutions to development problems often occur against a typical Western background. The importance of understanding the knowledge within a specific context is then not taken into account and Hobart (op.cit.) claims that the growth of such knowledge will lead to the growth of ignorance. The aim of development is not always to provide a solution to the problem of development, but rather to bring about planned social and economical change. Hobart (op. cit.) arguments that: "*defining development as a problem susceptible of a solution, or pathologically as a condition requiring a cure, may well be displaced.*"

Amin (1990) links up with Hobart (op. cit.) when he argues that maldevelopment will occur if development in developing countries were to take place against a Western background and if

developing countries were at the same time forced to be dependent on the developed world, because of the development initiative that comes from a Western perspective. It is therefore necessary that the development initiative should come from the local community in developing countries. According to Amin (1989) delinking has to take place in developing countries. This means that the effect of external economic interactions on the internal choices of developing countries should be neutralized. The developing world has to be delinked from the logical global system in an attempt to prevent maldevelopment. A developing country should therefore be in a position to continue and control the development, which was likely to be set in motion by a Western developed country, independent of the initiators thereof.

Education can be seen as the cornerstone of social and economic development (Haddad et al, 1990). Co-operative learning disposes the necessary attributes to help with social development, because it improves efficiency in the field of education by providing a supplementary approach to education and training (Grobler, 1995).

CO-OPERATIVE LEARNING

As universities struggle with social change, new technology, a rapidly expanding knowledge base and a multicultural university population, there is an ever increasing need to help learners understand basic skills and develop higher-order thinking abilities. "The ability to creatively think and solve problems co-operatively will become more important than ever" according to Adams et al (1990 : 103). The systematic incorporation of co-operative learning methods in tertiary education could result in the restructuring of the social system in which learners develop (Slavin et al, 1985).

DEFINITION OF CO-OPERATIVE LEARNING

Co-operative learning has been given many names in educational literature, including collaborative learning, collective learning, study circles, team learning, peer-group learning, syndicates, et cetera. The following is one of the more acceptable definitions of co-operative learning:

> *"Co-operative learning is an organizational structure in which a group of students pursue academic goals through collaborative efforts. Students work together in small groups, draw on each other's strengths, and assist each other in completing the task. This method encourages supportive relationships, good communication skills and higher-level thinking abilities" (Hilke, 1990 : 8).*

BASIC ELEMENTS OF CO-OPERATIVE LEARNING

According to Johnson & Johnson (1986) co-operative learning has five basic elements:

i. *Positive goal interdependence*, which occurs when learners undertake a group task with a feeling of mutuality. This is the most important element of a co-operative learning environment, because if learners believe that they cannot succeed unless everyone succeeds, the lesson is co-operative. Two categories of interdependence can be identified, namely outcome interdependence and means interdependence (Sharan, 1990).

ii. *Face-to-face promotive interaction*, which occurs when a verbal interchange takes place where learners explain how they obtained an answer or how a problem may be solved. Individuals must encourage and facilitate each other's efforts to complete tasks and to reach the group goals.

iii. *Individual accountability*, which means taking responsibility for learning material. Individual accountability can be accomplished through group rewards that are based on individual tests, individual representations on the group project or providing incentive for the learners to work together to learn new material, but to be tested individually.

iv. *Social skills*, which involves knowing how to communicate effectively and how to develop respect and trust within a group. Learners must be taught what skills are needed for high-quality co-operation. The more socially skilful learners are, the higher the achievement that can be expected within co-operative learning groups. *"If the potential of co-operative learning is to be realised,*

students must have the prerequisite interpersonal and small-group skills and be motivated to use them. These skills should be taught just as systematically as mathematics, social studies or any subject. ... they will also increase students' future employability, career success, quality of relationships and psychological health." according to Johnson & Johnson (in Brandt, 1991 : 54).

v. *Group processing* to reflect on how well the group is working and to analyse the members' effectiveness and how it may be improved. The purpose of group processing is to improve the effectiveness of the group members in order to achieve the group goals and must be done by the lecturer and the learners.

These five elements form an integral part of an effective co-operative learning process. These elements are not necessarily present in less formal approaches to group work. Killen (1992) states that co-operative learning can be considered as a formalised extension of group work. Co-operative learning involves more than just putting learners together in small groups and giving them a task to complete. It also involves careful thought and attention to various aspects of the group process, such as team-building exercises and selection of a co-operative learning method. In co-operative learning, the learners must not just do something as a group, they are required to learn something as a group. The success of the group depends on each learner's learning, which makes it necessary for learners to tutor each other and not simply exchange ideas and information (Killen, 1992). In co-operative learning groups, the members are typically heterogeneous in ability and personal characteristics, while traditional groups are often homogeneous. Co-operative learning groups are observed and analysed by the lecturer. Lecturer observation and intervention seldom take place in group work, where there is no intentional co-operative learning present in the group work.

THEORETICAL BACKGROUND

After nearly three decades of research into co-operative learning, there is general agreement that co-operative methods, which incorporate group goals and individual accountability, accelerate learning considerably. These methods also have a positive effect on a wide array of affective outcomes such as intergroup relations, acceptance of main streamed learners and self-esteem (Slavin, 1991).

Co-operative learning theories are dominated by two theoretical approaches, namely that of Piaget and Vygotsky. Piaget emphasised the importance of cognitive conflicts for knowledge restructuring. Vygotsky on the other hand, did not deny socio-cognitive conflicts, but stressed the importance of internalisation of processes on a social level (Mandl & Renkl, 1992). Vygotsky proposed that a stimulating environment awaken a variety of developmental processes within the learner, leading him/her to a higher level of cognition. Such a stimulating environment can be organised using co-operative learning, according to Nijhof & Kommers (in Slavin et al, 1985). Recent research, however, indicates a move away from the accentuation of the relationship between prerequisites and cognitive results, to information processing with the emphasis on task-specific information and prior knowledge.

THE EFFECTIVE USE OF CO-OPERATIVE LEARNING

Research on co-operative learning suggests that when used appropriately, co-operative learning can motivate learners, increase academic performance, encourage active learning, increase respect for diversity, promote literacy and language skills, help prepare learners for today's society and improve lecturer effectiveness (Slavin, 1991; Slavin et al, 1985; Sharan, 1990). The effective use of co-operative learning suggests that lecturers must instruct learners about the purpose of learning co-operative group skills. They have to use active learning techniques and relate what is being learned to the learner's personal and world environment. Respect for different learning styles must be part of the design of the learning environment (Hamm & Adams, 1992). Before deciding what learning strategy to use, the objectives and general nature of the academic content of the lesson must be considered. The following are examples of situations where co-operative learning may be appropriate (Killen, 1993):

⇨ Enhancement of learners' motivation and active participation;

- ⇒ improvement of communication skills;
- ⇒ concentration on teaching a small group while other learners engage actively in learning;
- ⇒ exchanging of ideas and learning from one another;
- ⇒ limited equipment or facilities which necessitates rotation of groups;
- ⇒ engaging in detailed analysis of some parts of lesson content;
- ⇒ improvement of problem-solving skills;
- ⇒ increasing depth of learners' understanding of course content by exploring and discussing their perceptions with other learners;
- ⇒ development of positive attitudes towards course content;
- ⇒ encouraging co-operation and respect for other learners' strengths, weaknesses and the diversity amongst learners;
- ⇒ teaching learners to be self-reliant; and
- ⇒ enhancement of self-esteem and inter-group acceptance.

Research on the implementation of co-operative learning methods, as recorded by Slavin et al (1985), can be summarised as follows:

- ⇒ Co-operative learning techniques can be used successfully with any type of academic task. It seems from research undertaken by Johnson & Johnson (in Slavin et al, 1985) that the more conceptual the learning tasks, the more efficient is the co-operation.
- ⇒ Co-operative groups must exhibit controversy among the group members, but the controversy should be managed constructively.
- ⇒ Learners should be encouraged to keep each other on track. The academic content should be discussed in ways that ensure the use of higher-order learning strategies.
- ⇒ Learners should support each other's efforts to achieve their goal and ensure that all the group members are involved in the discussions.
- ⇒ Co-operative groups should contain low-, medium- and high-ability learners.
- ⇒ Positive relationships and feelings of acceptance should be encouraged.

METHODS OF CO-OPERATIVE LEARNING

Co-operative learning methods are structured, systematic instructional strategies suitable for use in any learning environment. The methods are based on social psychological research and theory, but have been adapted to meet the practical requirements of the learning environment. The main objective of all the methods is always the same, heterogeneous groups working toward a common goal (Slavin et al, 1985:8). The success of all the methods of co-operative learning depends on the ability of learners to teach each other. Methods include Jigsaw, Student Team Learning, Circles of Learning and Group Investigation.

ADVANTAGES OF CO-OPERATIVE LEARNING

The advantages of co-operative learning are listed extensively in the literature (Slavin et al, 1985; Glass & Putman, 1988-1989; Sharan, 1990). The most important advantages seem to be the positive effect of co-operative learning on achievement and interpersonal and inter-ethnic relations. Augustine, Gruber & Hanson (in Brandt, 1991) are confident that co-operation promotes higher achievement, develops social skills and places the responsibility for learning on the learner's shoulders. Various authors mention the following advantages:

i. The competent implementation of co-operative learning creates conditions more conducive to higher-level learner motivation to learn, higher-level achievement for all learners and more positive social relations with peers from one's own and from other ethnic groups in the classroom, by comparison with the whole-class method (Sharan, 1990:298).

ii. Co-operative learning strategies boost individual self-esteem and encourage learners to take control of their own learning (Hilke, 1990:7).

iii. Sharing information forces information processing. Learners must relate their knowledge or skills to the other learners, which forces them to think in new ways.

iv. The lecturer can benefit from the explanations given by learners, because this gives the lecturer an insight into the learners' understanding and thinking.

v. The development of leadership and communication skills is two of the most obvious benefits of co-operative learning. Learners learn to assume authority, delegate responsibility and listen to others.

vi. The mixing of learners in co-operative groups help to break down social and academic barriers.

vii. Active participation, which is crucial for co-operative learning groups, can improve interest and motivation (Dockterman, 1991:40).

Hamm & Adams (1992) say that research has shown that co-operative learning, when used appropriately, motivates learners; increases academic performance; encourages active learning; increases respect for diversity; promotes literacy and language skills; helps prepare learners for today's society and improves lecturer effectiveness. In a study done by Glass & Putman (1988-1989) on the use of co-operative learning in lecturer education, they found that co-operative learning not only creates greater social interaction, but also makes the classroom more intellectually stimulating and productive.

OBSTACLES TO CO-OPERATIVE LEARNING

The following problems concerning co-operative learning are mentioned in the literature:

i. Lecturers have little experience of co-operative learning methods and tend to teach as they have been taught. It is therefore necessary to change teaching methods at college and university levels, before we can hope to change the school environment (Dockterman, 1991).

ii. According to Dockterman (1991: 41), co-operative learning activities threaten classroom control: "*Separating groups of students into small, unattended groups in which they are encouraged to talk to one another threatens the management of classroom behaviour*".

iii. Lectures have to be highly efficient in order to present a large amount of material within a short span of time. Lecturers with too much material to cover, will resort to the easiest and most efficient means of relaying the content, without adding an additional burden to their teaching load (Dockterman, 1991).

iv. The learner interaction in each group must be carefully monitored to avoid learners' wasting time discussing irrelevant issues (Dockterman, 1991).

v. Some learners prefer direct instruction and will have to learn how to co-operate in a group (Killen, 1992).

vi. In some instances, learners reported that they have to spend more time on a course taught by means of co-operative learning methods, than they do on traditionally taught courses (Killen, 1992).

vii. Learners find co-operative learning environments more demanding, because they have to play an active part in the learning process (Hiltz in CSCW'88, 1988).

It is sometimes imagined that a co-operative learning environment may reduce the cost of teaching. This is not true (Chung, 1991). When learners work together in groups in an organised way, then the time and effort that must go into organisation and management of the learning environment are significant.

THE DESIGN OF A CO-OPERATIVE LEARNING ENVIRONMENT

According to Collins, Brown & Newman, as quoted in Chung (1991), four dimensions constitute any learning environment. Content is important to differentiate between the types of knowledge needed to become an expert in a certain domain. Teaching methods should be designed to give learners the opportunity to observe, engage in and invent expert strategies. To facilitate the development of problem-solving skills, the lecturer should understand the sequencing of both integration and generalisation of knowledge and complex skills in the learning environment. Certain aspects of the social organisation of the learning environment encourage productive beliefs about the nature of learning and expertise.

Johnson & Johnson (1986) suggest five major tasks that the lecturer should address when designing a co-operative learning environment:

- Clearly specify the objectives for the co-operative learning session.
- Decide about the placing of the learners in groups before the start of the session.
- Carefully explain the task, goal structure and learning activity.
- Monitor the effectiveness of the co-operative groups and intervene when necessary to provide task assistance or to increase the learners' interpersonal and group skills.
- Evaluate learners' achievements and help them to discuss how they co-operated with one another.

In a co-operative learning environment, changes take place in the role of the lecturer and learner, and in the organisation of the classroom. These changes will be discussed when discussing the components involved in ITCL.

INFORMATION TECHNOLOGY SUPPORTED CO-OPERATIVE LEARNING (ITCL)

An ITCL environment exist when the instructional use of information technology is combined with the use of co-operative learning strategies (De Villiers, 1995), as discussed in the previous paragraph, to form a totally new environment. Information technology that can be used in a co-operative learning environment include the following: well-structured computer-assisted instruction, computer-mediated communication or electronic conferencing, interactive video, multimedia and hypermedia. Interactive video combines the best features of instructional video and computer-assisted instruction. Multimedia is the intersection of computers, sound, video and animation. Hypermedia can help lecturers by being a non-human information provider, which can leave the lecturer to fulfill the role of facilitator, mentor and coach. McConnell (1994) also mentions bulletin boards and online databases, although no examples of these are given.

THE DIFFUSION OF INFORMATION TECHNOLOGY SUPPORTED CO-OPERATIVE LEARNING

The successful implementation of ITCL is a prerequisite for the acceptance and diffusion of technology intervention. Leonard-Barton (1988) describes transferability as a needed condition for the implementation of a new technology. According to her, transferability consists of two dimensions, namely readiness and communicability. Readiness refers to the degree in which the technology has proved its feasibility. ITCL has already proved that it is a feasible teaching method. The second dimension of communicability refers to the degree in which the "know-how" of the technology and the underlying scientific principles, "know-why", are communicated to the people. Communicability of a technology can be determined by the availability of formal training for the people. The implementers of information technology must take the educational level, the cultural nature and the general perspectives of the users into account during the implementation process (Froneman & Roode, 1996). If we look at ITCL as an innovation, then diffusion of ITCL will only take place if it is accepted by the organisation, in this case the university, and if it is to the advantage of the organisation. If universities do not accept ITCL, it will not diffuse throughout the tertiary education system. The diffusion of ITCL will be greatly advanced if all the universities are linked via a wide area network. This is already in place in South Africa using the Uninet network, which also provides a link to the overseas universities.

TELECENTRES

International community centres (telecentres) are created as a method to help with the social, cultural and economic development of rural communities. Telecommunications and information technology provide access to a wide variety of information resources for communities and, at the same time, satisfy a wide range of education and training needs. A telecentre can be defined (Qvortrup, in Grobler, 1995) as a manned local centre which provides access to computer and communication tools for local communities in rural areas. A telecentre helps the people to get access to telephones, distance education, courses

and meeting facilities. Telecentres can be divided into the following components: users, personnel, infrastructure, services, location, finance and the representative body (Grobler, 1995). It is important to analyse each of these components when planning such a centre.

The community centre concept can be used in developing countries to address the educational problems of those countries. It can be used to enhance the availability of education and training using telecommunications and information technology to provide teaching opportunities to lower-income communities. The effectiveness and efficiency of training and education can be enhanced because these centres make it possible to share resources.

THE COMPONENTS INVOLVED IN DEVELOPMENT PROJECTS WITH ITCL AS UNDERLYING PRINCIPLE

The components involved in development projects with ITCL as underlying principle, is illustrated in Figure 1. This is done in order to set up a framework in the form of a structured questionnaire that can be used to evaluate such projects.

A telecentre provides an ideal opportunity to propagate education for development. In such a centre education can be improved with the aid of technology, by integrating educational technology with groupwork. In figure 1 an information technology supported telecentre for co-operative learning forms the centre point of the development project to be implemented. The co-operative learning environment in such a centre could be established according to the framework of De Villiers (1995).

The components involved in the development project and therefore also involved in ITCL will be discussed on the basis of figure 1.

Lecturer

The role of the lecturer in a co-operative learning environment is to operate as a mediator by means of dialogue and co-operation. This process is difficult and requires certain skills. According to Chung (In: De Villiers, 1995) the lecturer has to facilitate the learning and has to act as a coach. In order to accomplish this, the following tasks should be executed (*op. cit.*):

- Control the group dynamics, which involves determining the group size and group composition, fostering group cohesiveness, determining spatial arrangements, maintaining effective communication and facilitating effective leadership.
- Keep the groups on track, by initiating discussion, giving information, seeking information, giving opinion, orienting and co-ordinating.
- Unify each group by offering encouragement, mediating disputes, reaching a compromise, fostering communication and energising learners.
- Organise the class, which involves space, materials, equipment and learners, co-ordinating activities, monitoring individual groups and the whole class.
- Supervise group work by means of monitoring, tutoring, leading discussions, consulting, counseling and evaluating.
- Be available to work with individual learners or groups while the rest of the class is involved in group discussions.
- Have the opportunity to observe the thinking process of the learners, for example where they get stuck, how they misinterpret definitions, et cetera.

When co-operative learning is implemented in an environment where the learners were previously used to a well-structured one-to-one approach, it can lead to disaster in the classroom. The lecturer should therefore be aware of that and should be able to foster strict control and management of the learning activities.

Like any other new teaching concept, co-operative learning requires training, exercise and repetition over time, before becoming present-at-hand. Direct training of lecturers in the use of co-operative learning is therefore a prerequisite for the successful implementation thereof. To get the best results, the lecturers should be trained in a co-operative learning environment on how to use this approach. In such a situation the lecturer can experience co-operative learning as a learner and can discover what is expected and required of the learner when implementing the approach in the classroom.

Not only do lecturers have to be trained in the use of co-operative learning, but they also have to be familiar with information technology support. They have to be able to use information technology support in the preparation of their lectures and in the classroom environment, while they assist the learners in using it at the same time.

In developing countries the lecturers, of whom it is expected to use ITCL, may be totally computer illiterate. If they are caught unprepared, the social structure emerging from the technological intervention can lead to inconvenience, a demotion in self-confidence and anxiety. If the social structure, emerging because of the intervention of information technology support, is approached wrongly. ITCL can be seen as a failure.

The total support of the lecturers can be seen as the key to the success of the technology intervention. The social structures discussed above can lead to lecturers that refuse to apply ITCL in their teaching environment and that offer resistance to the planned change. Preparing and training the lecturers can therefore be seen as a first investment step in an attempt to make the technology intervention a success.

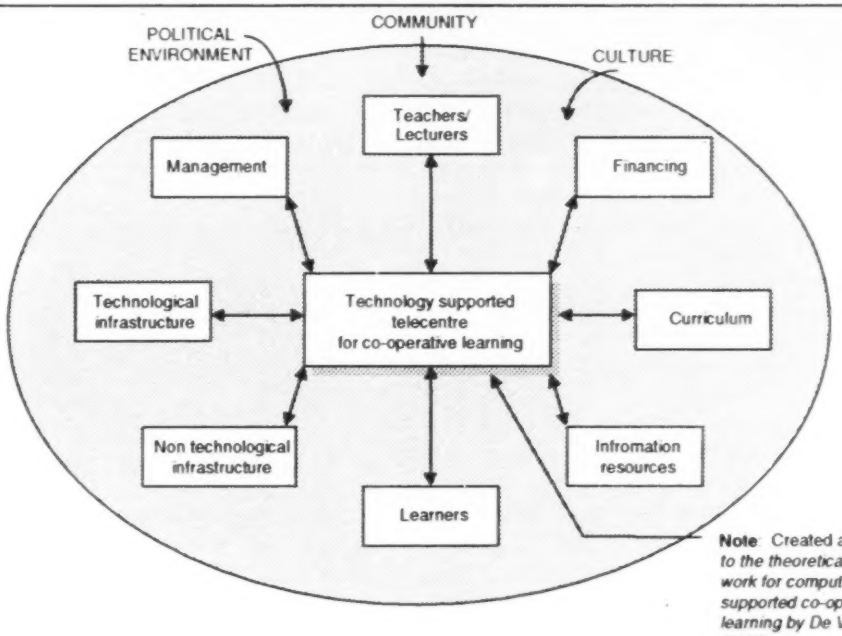
If lecturers refuse to implement the technological intervention, because they find it uncomfortable, incipient adoption and eventual diffusion of the intervention will not take place. Facilitators can be used to assist the lecturers in identifying and using information technology support for specific situations, but if the lecturers are not able to learn the skills and abilities, this process will not lead to real social development, because the lecturer will always remain dependent on the initiator. He/she will therefore not be able to continue the change in future without any help or assistance.

Learners

Learners need to assume new roles in a co-operative learning environment, namely those of collaborator and active participant. Learners share rather than compete with other learners

FIGURE 1

THE COMPONENTS INVOLVED IN DEVELOPMENT PROJECTS WITH ITCL AS UNDERLYING PRINCIPLE.



Note Created according *to the theoretical frame-work for computer supported co-operative learning by De Villiers (1995)*

and have the opportunity to act as both lecturer and learner. To be able to assume this new role:

- Learners need to learn to teach each other and be able to explain, demonstrate and develop their understanding of a concept/topic/subject.
- Learners must undergo a major shift in values and attitudes. Attitudes must change from individual ownership of ideas to co-operative work (Adams et al.,1990).
- Learners have to become tutors, expert consultants, investigators and presenters.
- Learners must each make a unique contribution to the group, due to the equal status among learners in most co-operative learning environments.

In the traditional classroom learners are taught that the lecturer is there to validate their thinking and direct learning. It will take time for learners to overcome the passive role that they used to play. A co-operative learning environment requires more group time of a learner. The learner may experience the whole process as slow and tedious and has to be informed of this beforehand. A positive side is that learning now takes place during the class and not only outside the classroom.

In the traditional learning environment communication, problem solving and decision skills are required from learners. Adding information technology (in the form of computer support) to this environment will extend the required skills to, among others, include keyboard skills. Extending the environment further to an ITCL environment, will except for the previous mentioned skills, also include advanced communication skills and co-operative learning abilities.
Bringing information technology into the learning environment may also lead to the learners feeling uncomfortable and threatened by the technology. They may even offer resistance to the change. The social structures flowing from this intervention should therefore be approached correctly and learners should be taught to apply the technology as a mean to reach their learning objectives. The learners form part of the receivers of the new learning process and of the information technology intervention. Their level of competence should therefore also be taken into account when "moving" the technology for real social development and delinking to take place.

Curriculum

The quality of the curriculum is essential for the effectiveness of any technological application (Lockheed, et al., 1991). In achieving an educational objective the specific medium used to convey the message, is only as effective as the message (content) and the cleverness/skill with which the medium is applied to communicate the content. No tools/technology, no matter how sophisticated, can guarantee good education with poorly prepared course material.

Lecturers should not hope to improve the existing curriculum by adding information technology or co-operative learning - the curriculum should be replanned to provide for this. More time should be allowed for co-operative learning and the learning objectives should be well defined. Through this the lecturer can be sure that the relevant study material is covered and the learner can monitor his/her own learning as well as the learning of the group.

The culture, the ethnical group, skills, ability and the learners' frame of reference should be taken into account when designing computer based lectures and evaluation (Grobler, 1995).

Non-Technological and Technological Infrastructure

The non-technological infrastructure includes the buildings, like a community centre, that consists of the necessary lecture halls within which ITCL environments can be created. Although the desks and chairs in the traditional lecture hall are not ideal for grouping learners, it can provisionally be seen as adequate and no additional expenditure need to be incurred to change it.
For lecturers to get used to the information technology they have to apply in the learning environment, they have to have invariably access to information technology support (like computer hardware and software). An infrastructure that will put lecturers in a position to experience information technology support, so that they will be able to implement it in the classroom, has to be identified and put into place.

The existing infrastructure like telephone lines, electricity and fax machines can initially be used to facilitate the communication process, without additional costs. The infrastructure can be expanded in phases, starting with a computer network structure in a community centre and expanding it across the country and later even to other countries.

Management

According to Odedra-Straub (1995) development initiatives in developing countries should come from the local community. The community centre, and therefore also the development project with ITCL as foundation, should be managed by the community. It is thus the responsibility of the management selected by the community, to decide upon the courses/subjects to present and to determine the time, period and place to educate the lecturers on co-operative learning methods and the use of information technology. They may use the facilitators to guide them, but they have to gain benefit from the development process started by others and they should be able to continue with it and control it in order to prevent maldevelopment (Amin, 1990) and to ensure that delinking (Amin, 1989) takes place.

Financing

The development project should include the financial support of suitable institutional entities. A project, which depends greatly on foreign assistance, can fall to pieces if the support stops with no alternative domestic resources available to take over the financial burden. If the government is financially tied to the project, it will also have a stronger institutional commitment to the project.

The ideal is for the community to invest in the project. The concept of community centres is community driven. It can encourage the community to invest in human capital and through this in their own future.

Information Resources

The full support of the lecturers provides the key to a successful technological intervention. Facilitators can be used as information resources to assist lecturers in the identification and usage of co-operative learning methods and information technology support for a specific situation. Other information resources could be the library, or even the Internet. Learners and lecturers need this information to assist them in the education and learning process.

Community, Politics and Culture

A development project is implemented in a specific community with a definite political structure and culture. Information technology is not only culturally dependent, but also culturally defined (Postman, 1993). In order to 'move' ITCL to developing countries in a meaningful way, the culture of the receivers should be taken into account. The information technology used has to be culturally acceptable to the community within which it will be implemented and it should address and take account of the specific needs and unique situation of the community.

Socio-cultural aspects affect political acceptance. The language used in the project can be a problem in a country where more than one language is important. Cultural, religious and ethnic traditions can also be stumbling blocks in a country with great diversity.

WHY IS IT IMPORTANT TO EVALUATE ITCL FOR DEVELOPMENT?

According to Ely and Plomp (1986) there are several aspects that contribute to successful and unsuccessful projects. Unsuccessful projects have often been the result where objectives for using information technology were not clear. People using it often see it as a method instead of a systematic approach to education for development. In some cases the equipment used is seen as more important than the design of the program and the compliant course material. Some people experience information technology as a threat and resist changing. The receivers of the technology intervention may experience a lack of support if no support system was set up and if no extra time was included for training in the use of the technology.

Change programs with regard to education in developing countries are often extensive projects with national, social and economic objectives. Verspoor (1989) warns that such projects can easily fail if the implementing thereof are not

planned and managed well. Extensive projects function on a basis of guidelines and procedures, which are applicable in general. It is therefore not designed to fulfil specific requirements of a unique situation. Successful change programs have to aim at local acceptance within a framework of nationally defined change objectives.

In paragraph 7 attention was paid to the implementation of a development project based on ITCL and more specific to the components involved in the implementation thereof. Attention was paid to aspects needed for the successful implementation of each component. This framework for implementation will therefore be used to set up an evaluation framework, which can be applied to evaluate the planning of a development project based on ITCL.

A FRAMEWORK FOR EVALUATING ITCL FOR DEVELOPMENT

A framework in the form of a questionnaire will be structured according to the components set out in figure 1. This framework can be used to evaluate development projects based on ITCL before the implementation thereof.

A Structured Evaluation Questionnaire:

Section A

Evaluating the components involved in the implementing

1. **The lecturers**
   - 1.1 Are the lecturers prepared and trained for the implementation of a ITCL environment? How will this be done?
   - 1.2 Are the lecturers familiar with the technology to be used?
   - 1.3 Are the lecturers familiar with the skills and competencies required to utilize and implement a ITCL environment?
   - 1.4 Do we understand the existing social structures before we implement ITCL, so that we can observe and try to understand the impact of ITCL?
   - 1.5 Will the lecturers be empowered to continue using the ITCL environment after the initial pilot period? How will this be done?
2. **The learners**
   - 2.1 Will learners, used to a more passive learning environment, be given time to adapt to the environment of groupwork?
   - 2.2 Will learners be given training about co-operative learning, preparing them for the ITCL environment?
   - 2.3 Are learners at least functionally computer literate?
3. **The curriculum**
   - 3.1 Does a curriculum, which is specifically designed for an ITCL environment, exist for the teaching of the various subjects?
   - 3.2 Does the curriculum provide enough time for co-operative learning?
   - 3.3 Is there enough course material/software for use in an ITCL environment?
4. **Non-technological and technological infrastructure**
   - 4.1 Is there an adequate infrastructure where the ITCL environment could be created?
   - 4.2 Is there electrical power available?
   - 4.3 Is there a computer laboratory to which the lecturers will have access, preparing them for the ITCL environment?
   - 4.4 Is there an existing telecommunications infrastructure, in the form of telephone lines that can be used to support the communications process from and to the learning centre, without any additional costs?
   - 4.5 Will it be possible to link this telecentre to other similar centres?
5. **Management**
   - 5.1 What has been the involvement of the local community in the establishment of the telecentre?
   - 5.2 Does the community manage the telecentre? Will the community manage the development project, built around the ITCL approach?
   - 5.3 What will be the involvement of the community in determining which subjects to teach at the centre, what ABET to provide, and how to prepare lecturers for supporting and using the ITCL environment?
6. **Financing**
   - 6.1 Is there adequate funding for the implementation of an ITCL environment

and all ancillary infrastructure and preparatory work?

6.2 Is there adequate funding for the continued operation of the project beyond the initial pilot phase?

6.3 What financial responsibility will the community take for the project and its eventual continued operation?

7. Information resources

7.1 Will lecturers have access to the necessary information and support resources to enable them to use ITCL in specific situations?

7.2 Will lecturers have access to other information resources such as libraries and the Internet?

8. Community, politics and culture

8.1 Will the technology intervention be culturally acceptable to the community and persons involved in the teaching and learning process?

8.2 Does the project address specific needs of the community?

8.3 Does the project recognise any specific, unique aspects of the community where it will be implemented?

8.4 Will it be possible to use ITCL to enrich the current teaching/learning process, given the particular circumstances within the community?

Section B

Evaluating the total project

1. Are all the components involved in the implementation of ITCL evaluated using Section A of this framework?
2. Is the project cost effective and feasible?
3. Is the ITCL pedagogically suitable for solving the education problems in the community and will it therefore meet the requirements of the lecturers and learners - is it a suitable medium to convey the content?
4. Is there sufficient administrative manpower for implementing the control over and the maintenance of the project?
5. Is the environment in which the project will be implemented well planned and designed?
6. Is the reason for applying ITCL clear to all the participants? Do they understand that it is not only a method, but also a systematic approach to education for development?
7. Is the climate set for change, with the necessary social support systems to support the individual in accepting the technology intervention?

A similar structured questionnaire can be set up for evaluating the implemented project. The following are examples of questions to be asked in such a questionnaire:

- Do learners experience the technology based learning as a method of education that eases up the learning process?
- Did the curriculum provide for the culture, ethnical group, skills, abilities and frame of reference of the learners?
- Does the project contribute to the social development of the community and therefore to the supplying of life sustenance, self esteem and freedom of choice and does it improve the quality of human lives?

CONCLUSIONS

Human resources form the fundamental basis for the wealth of nations (Harbison in: Todaro, 1989). The current education system in South Africa cannot fulfil the education and training requirements of its exponential growing workers corps while the investment limit possible in the national budget is already reached. It is necessary to allocate the existing resources in another way in order to satisfy the requirements more efficient and effective by investigating in alternative ways for example in technology for supporting education and training (WGTSET, 1994).

ITCL implies a specific information technology intervention and the application thereof in the education and training environment. The successful implementation thereof is a prerequisite for the acceptance and diffusion of the intervention. The framework set up in this paper, attempts to ensure the successful implementation thereof, as a contribution to the "process of improving the quality of all human lives." (Todaro, 1989).

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